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Agencies

# **FLOOD PLAIN MANAGEMENT**

**A Study Of South Fork  
Shenandoah Tributaries**

**Rockingham County, Virginia**

**APPENDIX II**

**QUAIL RUN – BOONE RUN**

**August 1983**

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## FOREWORD

The main report on the Flood Plain Management Study of South Fork Shenandoah River Tributaries provides information and data needed for use by administrators and the general public. Discussion of findings and recommendations relevant to the total study area are included.

Eight appendixes or technical reports include specifics on each tributary as listed below. Tables, flood profiles and area-flooded photomaps provide information for user agencies and individuals to make technical decisions and to comply with regulations related to the use of flood plains.

Appendix I	Stony Run
Appendix II	Quail Run - Boone Run
Appendix III	Cub Run - Big Run
Appendix IV	Naked Creek
Appendix V	Dry Run
Appendix VI	Hawksbill Creek
Appendix VII	Mill Creek - Congers Creek
Appendix VIII	Pleasant Run

Appreciation is extended to those who contributed their active interest, cooperation, and information to this project.

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APPENDIX II  
South Fork Shenandoah River Tributaries  
FLOOD PLAIN MANAGEMENT STUDY  
Technical Report  
QUAIL RUN - BOONE RUN  
Rockingham County, Virginia

INTRODUCTION

This technical report on Quail Run - Boone Run is one of eight such appendixes to the Flood Plain Management Study on South Fork Shenandoah River Tributaries. The main report includes items such as authorities, responsibilities, scope, procedures, description, recommendations, and data common to the tributaries and relevant to the total project.

The first sections of this appendix present general information pertinent to the study on Quail Run - Boone Run. Included are brief discussions of natural values, alternate solutions to the flood problems, and suggested items for the flood plain management program. The last section contains data and exhibits needed to make technical decisions for regulation and use of the flood plain.

DESCRIPTION OF STUDY AREA

Upstream Drainage Area

The Quail Run - Boone Run drainage area consists of 18.35 square miles above its mouth at the South Fork Shenandoah River (See Figure 1). This is an area comprised of 4.34 square miles from Bloomer Spring, 7.41 square miles from Boone Run, and 6.6 square miles from Quail Run. The Shenandoah River is a subbasin of the Potomac River which is in the Mid-Atlantic Region as designated by the Water Resources Council. The USGS Hydrologic Unit code number in the area is 02070005. Soils in the upper end of the drainage area are formed mainly in residuum of dominantly sandstone, shale, or greenstone and colluvial material from these areas. Laidig-Buchanan-Berks and Drall-Laidig are the predominant soil associations. Soils in the lower end are formed in residuum of limestone, dolomite and calcareous shale. Frederick-Lodi-Rock Outcrop and Chilhowie-Edom are the predominant soil associations. Soils at the mouth of Quail Run are formed in alluvial or colluvial material, with Monongahela-Unison-Cotaco being the predominant soil associations. Land use is about 48 percent woodland, 23 percent pasture or meadow, 16 percent cropland, 11.5 percent urban, and 1.5 percent rural residential, farmstead, and other built up areas.

## Flood Plain

The study area includes the flood plain along 2.2 miles of Bloomer Spring, 3 miles of Boone Run, and 7 miles of Quail Run. It extends from the junction at South Fork Shenandoah River up Quail Run to Hopkins Spring. Boone Run is a tributary of Quail Run and Bloomer Spring a tributary of Boone Run. Bloomer Spring runs into Boone Run at the community of East Point; with Boone Run continuing to Mount Sinai Church. Land use in the flood plain is predominantly pasture, hay and meadow.

## Natural and Beneficial Flood Plain Values

Quail Run is a warm to cool water mountain valley stream with limited game and good non-game fish populations. This stream is too small to support fishable populations. Stream bank erosion and sedimentation occur on this stream. Bank stabilization and establishment of stream borders would help improve aquatic and terrestrial habitats. Boone Run supports wild or "put and take" trout populations, primarily in its headwaters. This stream is mostly in wooded cover which provides good habitat for fish and wildlife populations. Practices that maintain this forest cover would be the best way to preserve this high natural value. None of the streams inventoried in Rockingham County contain any known nationally threatened or endangered species, or significant wetlands. Two important fish species that occur in the Potomac River drainage, of which these streams are a part, possibly inhabit some of these streams. These are Pearl Dace, (*Semotilus Margarita*), and the Slimy Sculpin (*Cottus Cognatus*). These fish were recognized by the Endangered Species Symposium at Virginia Polytechnic Institute and State University at Blacksburg in May 1979, as being of "special concern" to the State of Virginia.

## FLOOD HISTORY

Quail Run is primarily an agricultural area. Damages to crops, pastures and roads are estimated at \$15,000 to \$30,000 annually. Damage to the roads and bridges might be alleviated by raising some of the fills and enlarging the bridge openings. Use of agricultural land is limited due to the flood hazard. Boone Run is primarily an agricultural watershed with narrow flood plains. It is about half pasture and half woods. Annual damages, including roads and bridges are estimated at \$2,000 to \$3,000.

## FLOOD POTENTIAL

### Present Conditions

Extreme floods would inundate about 440 acres of primarily agricultural land. Velocities would average about 3.5 feet per second and exceed six feet per second in some reaches. Out-of-bank stages would range from about 1.5 to 8.5 feet. Varying amounts of damage would occur to the five bridges and one structure present in the flood plain. Extensive damage would be done to the land with approximately 404 acres inundated by the 100 year flood, and 440 acres by the 500 year flood.

Limitations on Use of Data. The flood elevations given in this report should be considered as minimum elevations. During floods, uprooted trees and other debris may collect on bridges and culverts and clog the channels. Such obstructions increase the depth and extent of flooding. Analyses were made without showing the effects of potential obstructions. Also, extremely rare events such as dam failure and climatic changes were not analyzed.

#### Future Conditions

The hydrologic conditions in the upstream areas are expected to improve as farmers and foresters continue to apply good management and conservation practices. This improvement is expected to reduce runoff approximately to the extent that additional development will increase runoff. Therefore, the flood hazard and damage potential is not expected to change significantly in the next 10 to 15 years.

### FLOOD PLAIN MANAGEMENT

The main report includes a discussion of existing programs, current regulations, availability of flood insurance, recommendations, and related items relevant to the total study. The items discussed below relate only to Quail Run - Boone Run.

Floodway. The data for a "first trial" or computed floodway is filed with the basic data for Quail Run - Boone Run. The results indicate that hazardous conditions of depth and/or velocity prevail at current 100-year flood levels in all reaches, and that generally no additional encroachment in the flood plain should be allowed. The data can be used as a basis for further study of local measures, but it is suggested that no continuous or extensive floodway be considered.

#### Recommendations

In preparation of their comprehensive flood management program, the local sponsors should implement the following recommendations on Quail Run - Boone Run:

- Monitor future developments in the watershed to assure that regulations are followed so as not to increase the flood hazard;
- Assist landowners in studies of local protection measures to reduce streambank erosion and the spread of floodwaters; and
- Encourage the re-establishment of natural vegetation in the flood plain to restore the fish and wildlife habitat.



## Evaluation of Potential

The potential for reducing the flood hazard on Quail Run - Boone Run is limited by the relatively low value of average annual flood damages. Yet, the damages are great enough that the "do-nothing" alternate does not warrant serious consideration.

Conversely, a brief study of contour maps indicates that flood control dams could not be economically justified. On the steep gradients, construction costs added to the costs of land rights would be excessive when related to resultant benefits.

Hydrologic conditions under current land use and management practices are generally good to excellent. An improved conservation use-and-land treatment only program would provide only limited reductions in runoff and flood stages.

A program of raising bridges and enlarging bridge openings should be considered.

These observations apply generally to all the study tributaries as do the recommendations listed in the main report. The primary opportunities have to do with prohibition of future construction or other encroachment in the flood plains; and with other regulations needed to avoid increased runoff and to minimize flood damages.

## TECHNICAL DATA AND EXHIBITS

This section provides the data and exhibits needed by user agencies and individuals to make technical decisions and to comply with regulations on use of the flood plain on Quail Run - Boone Run.

The index map shows the area covered by the individual photomaps. Flood hazard photomaps show the area inundated by the 100 and 500-year floods. Where only one line is shown, there is no significant difference in the boundaries of the two flood areas. These photomaps should only be used to determine approximate flood elevations; they are based on semicontrolled mosaics and the boundaries shown may vary from the location on the ground.

Flood profile plates provide elevations of the 10, 50, 100 and 500-year floods at any location along the length of the streams. The elevations and discharges of the 10, 25, 50, 100 and 500-year flood at each surveyed cross section are given in Table QR-1. Sample cross sections illustrated how the flood area boundaries were located. Table QR-2 provides the description and elevation of benchmarks which are located on the photomaps.

Table QR-1 can be used to locate flood elevations on the ground at surveyed cross sections.

The photomaps, flood profiles and bench mark data can be used to locate flood elevations between surveyed cross sections, as follows:

1. On the appropriate photomap find the point on the stream where the flood line is to be located; then scale the distance along the stream to the nearest cross section.
2. On the appropriate flood profile sheet, scale the distance determined in Step 1 from the cross section back to the original stream location, and read the elevation of the desired flood frequency line.
3. Transfer the elevation determined in Step 2 to the ground from the nearest established benchmark.

A glossary, bibliography and discussion of technical procedures are included in the main report for this study. The basic data is on file in the office of the USDA Soil Conservation Service, Richmond, Virginia 23240.









**LEGEND**

→ Stream channel

500 year flood area

100 year flood area

2 Stream miles

16 Surveyed sections

× BM 2 Bench mark

NOTE: When only one line and color is shown the 100 and 500 year flood areas are the same.



SOURCE: Semi-controlled mosaic prepared from USDA-ASCS Aerial photography flown 1974

USDA-SCS-FORT WORTH, TEXAS 1983

U. S. DEPARTMENT OF AGRICULTURE  
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FLOOD HAZARD AREA  
SOUTH FORK SHENANDOAH RIVER  
TRIBUTARIES-QUAIL RUN  
ROCKINGHAM COUNTY, VIRGINIA

NOVEMBER 1981

SHEET QR1 OF QR3





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SOIL CONSERVATION SERVICE

FLOOD HAZARD AREA  
SOUTH FORK SHENANDOAH RIVER  
TRIBUTARIES-QUAIL RUN  
ROCKINGHAM COUNTY, VIRGINIA

NOVEMBER 1971

SHEET 22 OF 22

LEGEND

- Stream channel  
500 year flood area  
100 year flood area  
2 Stream miles  
16 Surveyed sections  
× BM 2 Bench mark

NOTE: When only one line and color is shown the 100 and 500 year flood areas are the same.



SOURCE: Semi-controlled mosaic prepared from  
USDA-ASCS Aerial photography flown 1974

USDA-SCS-FORT WORTH, TEXAS 1983







**LEGEND**

→ Stream channel

500 year flood area

100 year flood area

2 Stream miles

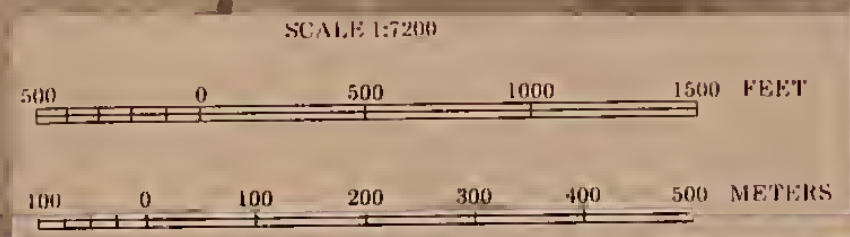
16 Surveyed x - sections

x **BM 2** Bench mark

**NOTE:** When only one line and color is shown the 100 and 500 year flood areas are the same.

SOURCE: Best available data provided by  
USDA-ASCS Aerial photography flown 1974

USDA-SCS FORT WORTH, TEXAS 1983



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**FLOOD HAZARD AREA  
SOUTH FORK SHENANDOAH RIVER  
TRIBUTARIES-QUAIL RUN  
ROCKINGHAM COUNTY, VIRGINIA**

NOVEMBER 1981

SHEET QR3 OF QR3





**LEGEND**

→ Stream channel

500 year flood area

100 year flood area

2 Stream miles

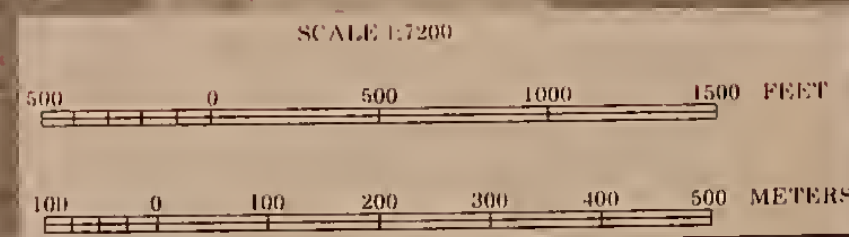
16 Surveyed sections

× BM 2 Bench mark

**NOTE:** When only one line and color is shown the 100 and 500 year flood areas are the same.



SOURCE: Semi-controlled mosaic prepared from  
USDA-ASCS Aerial photography flown 1974



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**FLOOD HAZARD AREA  
SOUTH FORK SHENANDOAH RIVER  
TRIBUTARIES-BOONE RUN  
ROCKINGHAM COUNTY, VIRGINIA**

NOVEMBER 1981

SHEET BR1

BS 62  
UPPER LIMIT OF STUDY





# LEGEND

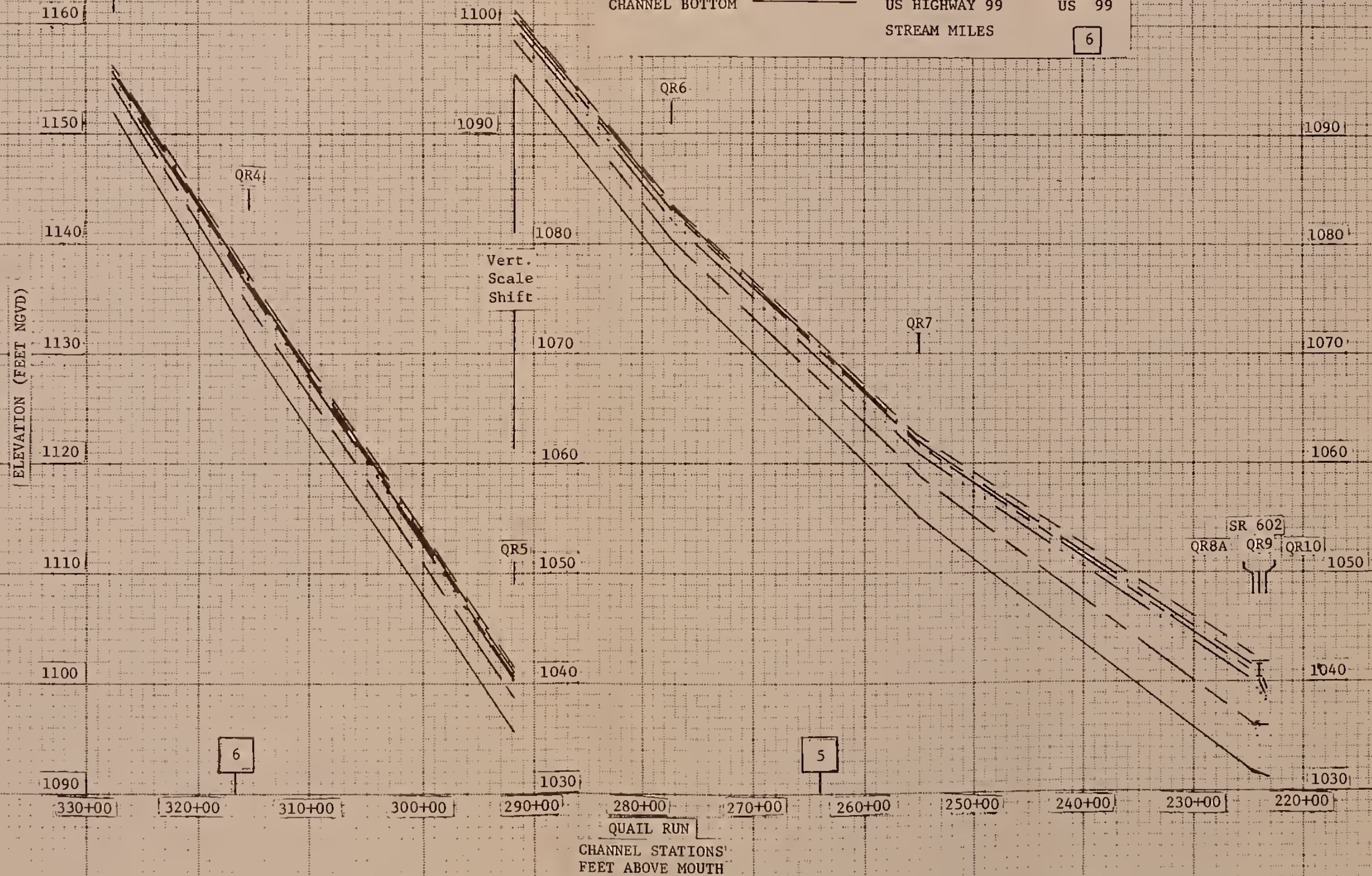
500 YR	-----	SURVEYED X-SECTION	QR7
100 YR	-----	ELEV-BRIDGE DECK	I
50 YR	-----	ELEV-LOW BEAM	I
10 YR	-----	ELEV-LOW ROAD	---
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	6

## FLOOD PROFILES

S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA  
U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Designated \_\_\_\_\_ Date \_\_\_\_\_  
Project MAM 10/79  
Traced \_\_\_\_\_  
Checked \_\_\_\_\_  
PLATE 1 of 8  
QUAIL RUN - See  
Photomap QR1

UPPER  
LIMIT  
OF  
STUDY  
QR3





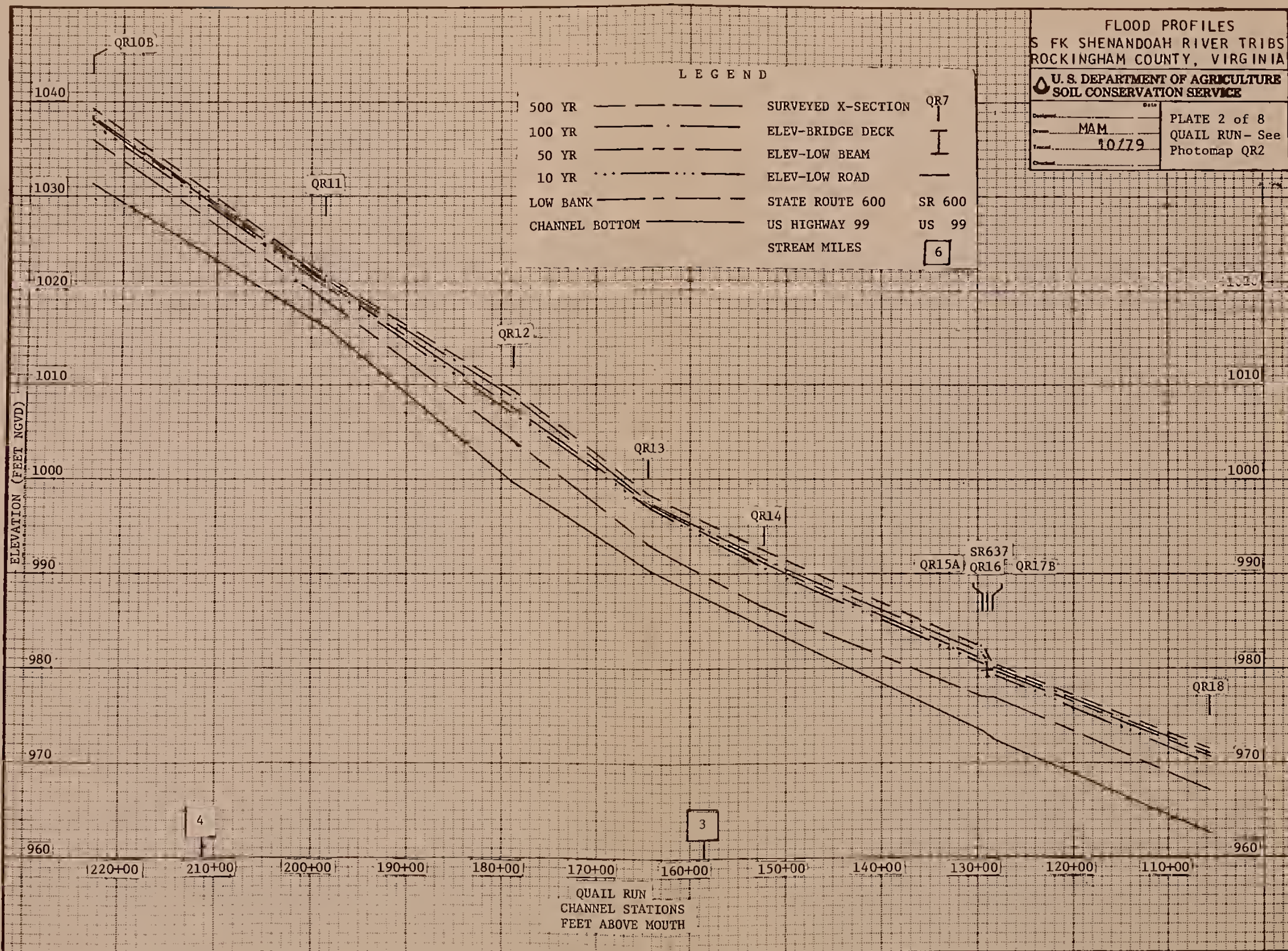
FLOOD PROFILES  
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Design: MAM  
Drawn: 10/79  
Checked:   
Date:   
Plate: PLATE 2 of 8  
Quail Run - See Photomap QR2

LEGEND

500 YR	-----	SURVEYED X-SECTION	QR7
100 YR	-----	ELEV-BRIDGE DECK	I
50 YR	-----	ELEV-LOW BEAM	I
10 YR	....	ELEV-LOW ROAD	---
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	6





FLOOD PROFILES  
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

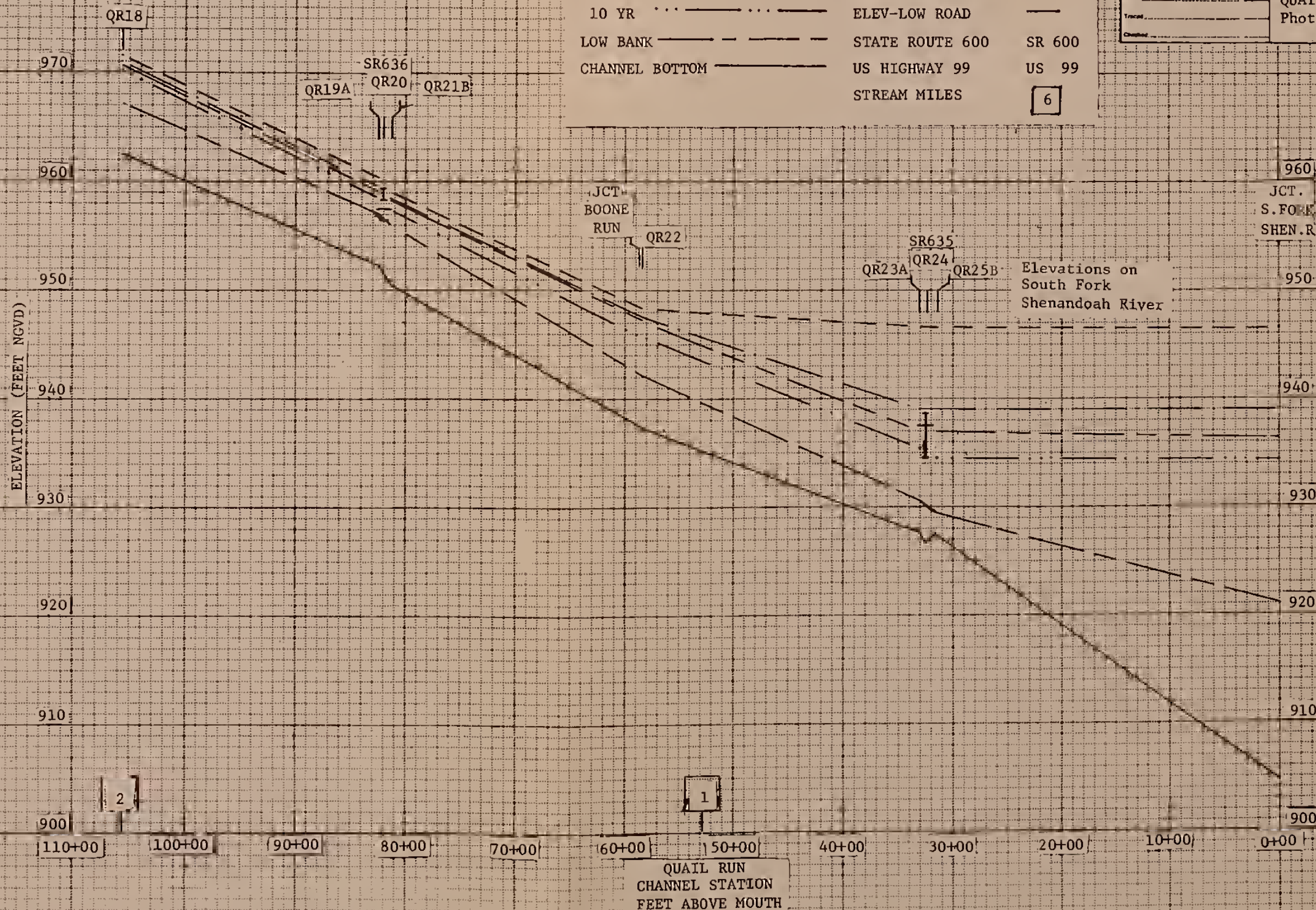
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SOIL CONSERVATION SERVICE

Original: MAM 10/79  
Date: 10/79  
Traced: \_\_\_\_\_  
Checked: \_\_\_\_\_

PLATE 3 of 8  
QUAIL RUN -See  
Photomap QR2&3

LEGEND

500 YR	-----	SURVEYED X-SECTION	QR7
100 YR	-----	ELEV-BRIDGE DECK	I
50 YR	-----	ELEV-LOW BEAM	I
10 YR	....	ELEV-LOW ROAD	---
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	6





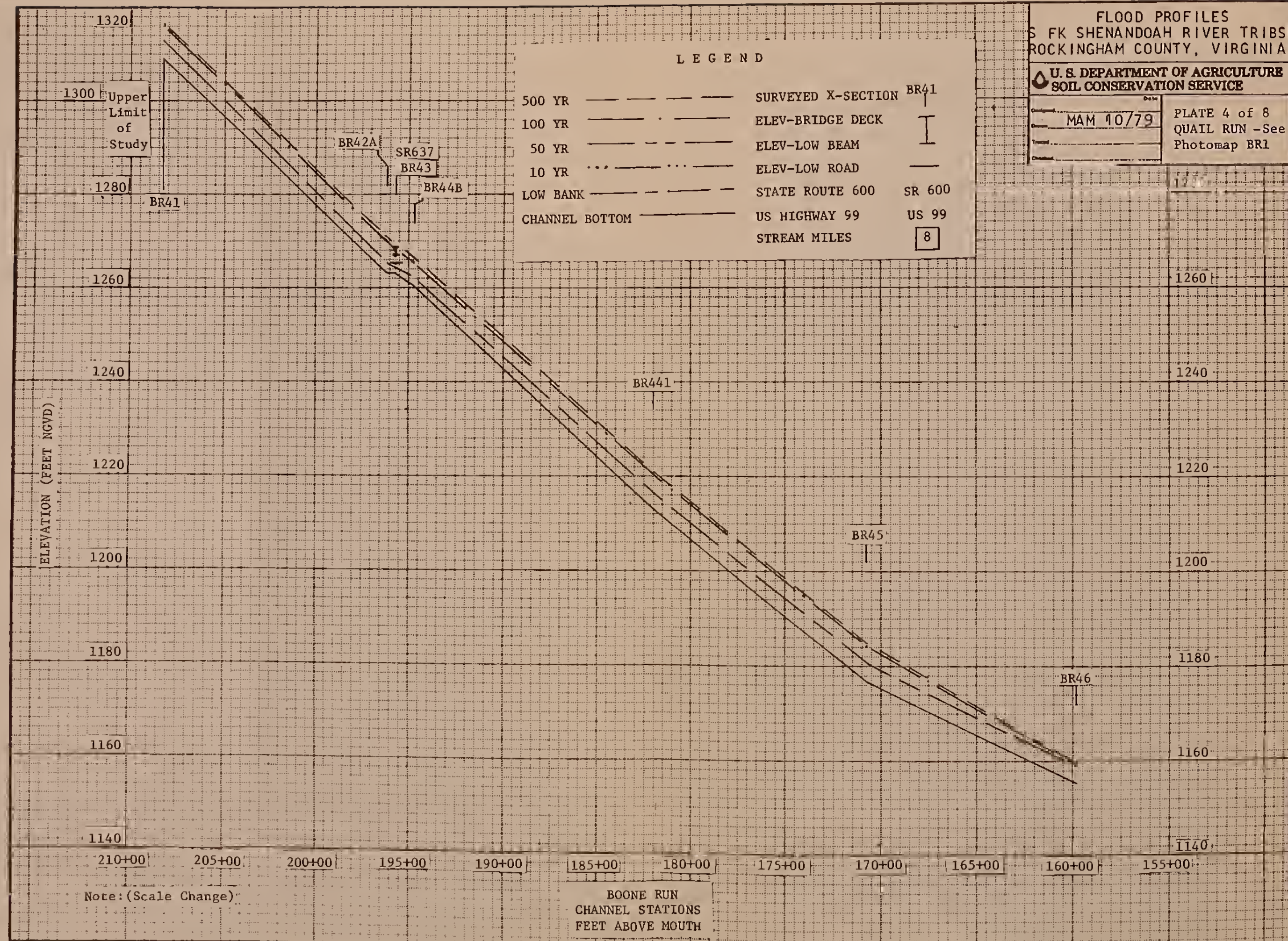
FLOOD PROFILES  
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

PLATE 4 of 8  
QUAIL RUN - See  
Photomap BR1

LEGEND

- |                |       |                    |        |
|----------------|-------|--------------------|--------|
| 500 YR         | ----- | SURVEYED X-SECTION | BR41   |
| 100 YR         | ----- | ELEV-BRIDGE DECK   | I      |
| 50 YR          | ----- | ELEV-LOW BEAM      | I      |
| 10 YR          | ....  | ELEV-LOW ROAD      | ---    |
| LOW BANK       | ----- | STATE ROUTE 600    | SR 600 |
| CHANNEL BOTTOM | ----- | US HIGHWAY 99      | US 99  |
|                |       | STREAM MILES       | 8      |



Note: (Scale Change)

BOONE RUN  
CHANNEL STATIONS  
FEET ABOVE MOUTH



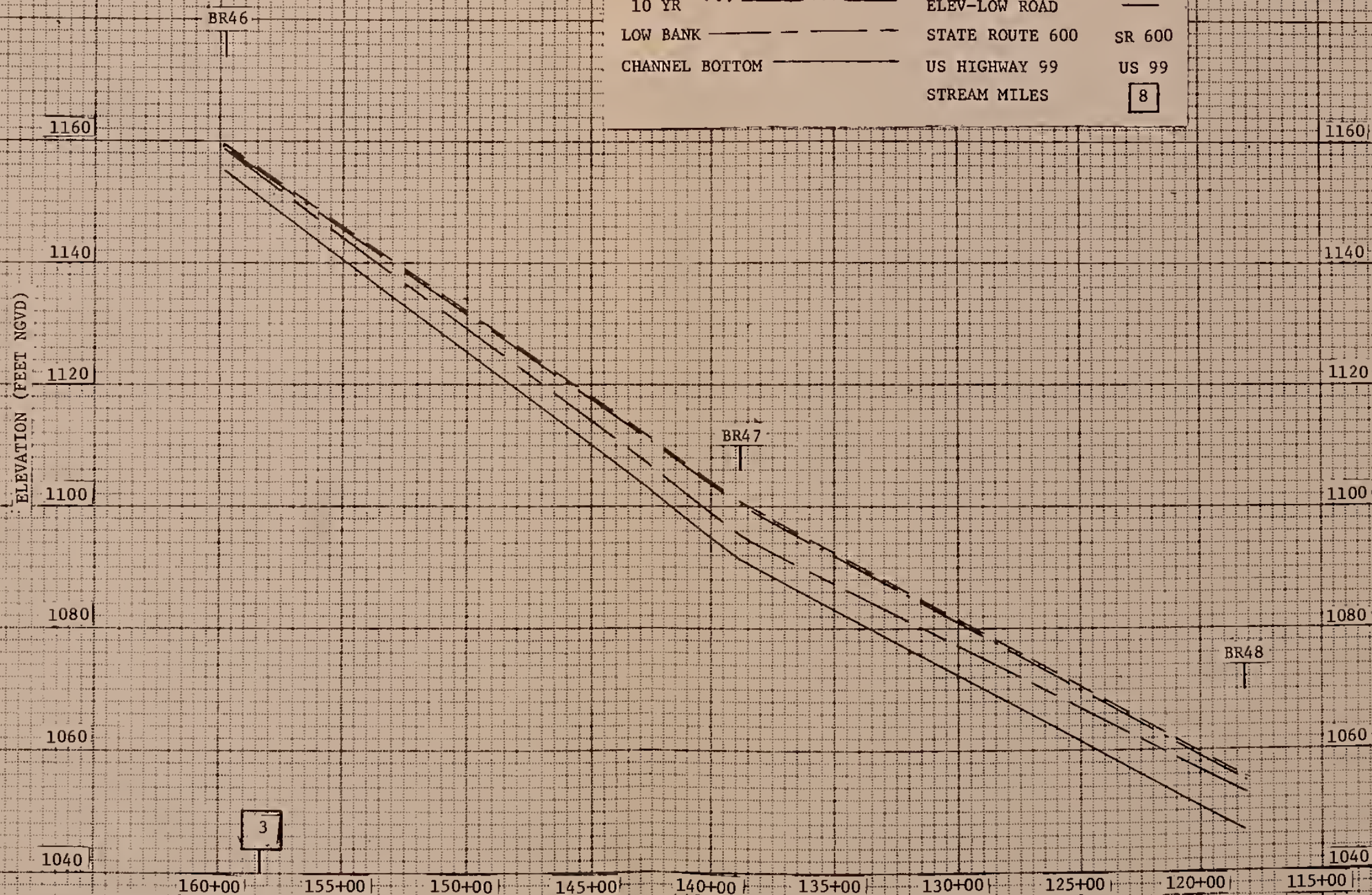
FLOOD PROFILES  
 S FK SHENANDOAH RIVER TRIBS  
 ROCKINGHAM COUNTY, VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE  
 SOIL CONSERVATION SERVICE

Designed: MAM 10/79 Date: PLATE 5 of 8  
 Drawn: QUAIL RUN - See  
 Traced: Photomap BR1  
 Checked:

LEGEND

500 YR	-----	SURVEYED X-SECTION	BR41
100 YR	-----	ELEV-BRIDGE DECK	I
50 YR	-----	ELEV-LOW BEAM	I
10 YR	....	ELEV-LOW ROAD	---
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	8



Note: (Scale Change)

BOONE RUN  
 CHANNEL STATIONS  
 FEET ABOVE MOUTH



# FLOOD PROFILES

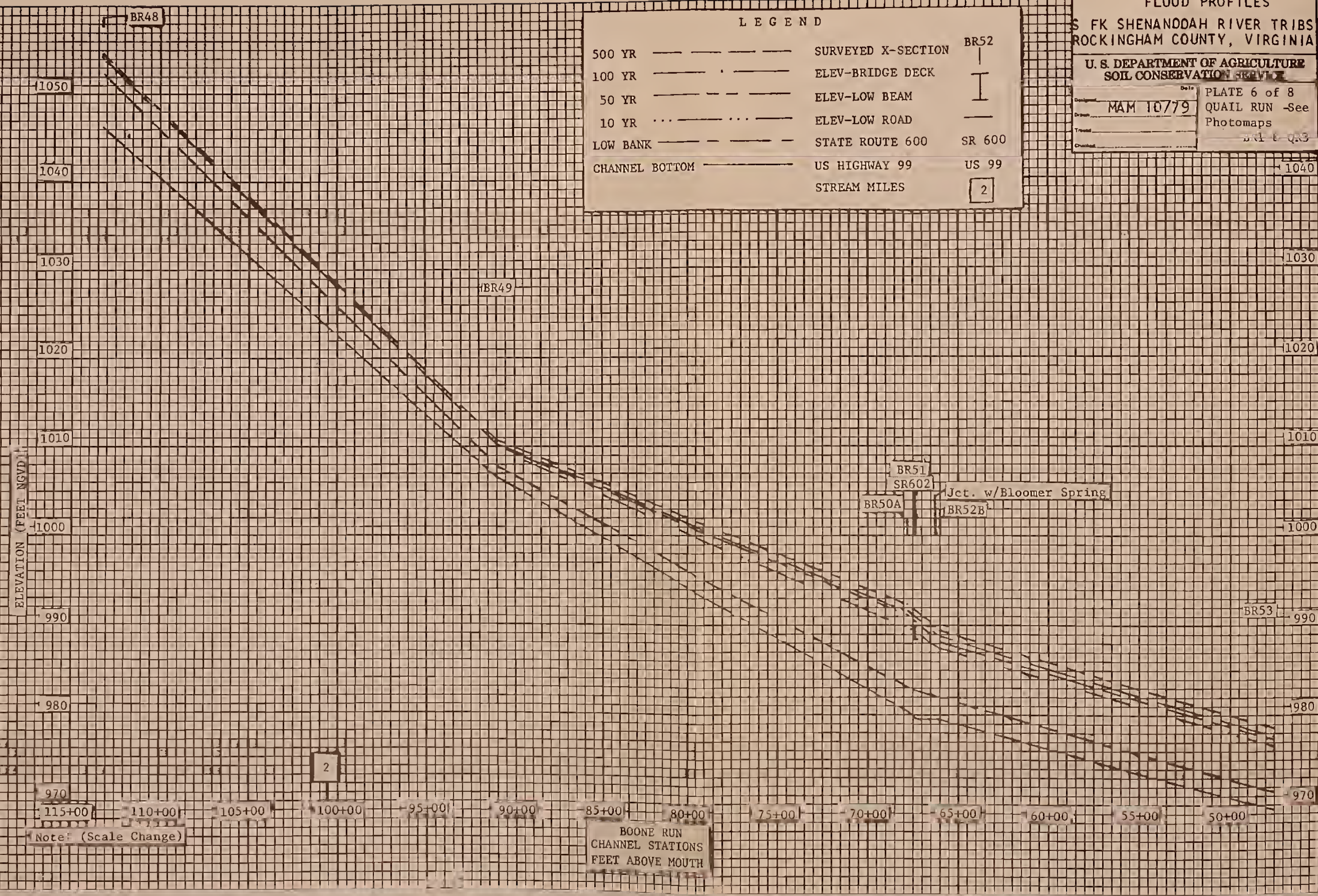
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

U. S. DEPARTMENT OF AGRICULTURE  
SOIL CONSERVATION SERVICE

Design: MAM 10/7/79 Date: PLATE 6 of 8  
Drawn: QUAIL RUN -See  
Treated: Photomaps  
Checked: BR 1-6 QRS

## LEGEND

500 YR	— — — — —	SURVEYED X-SECTION	BR52
100 YR	— — — — —	ELEV-BRIDGE DECK	I
50 YR	— — — — —	ELEV-LOW BEAM	I
10 YR	... — — — —	ELEV-LOW ROAD	—
LOW BANK	— — — — —	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	— — — — —	US HIGHWAY 99	US 99
		STREAM MILES	2



Note: (Scale Change)

BOONE RUN  
CHANNEL STATIONS  
FEET ABOVE MOUTH



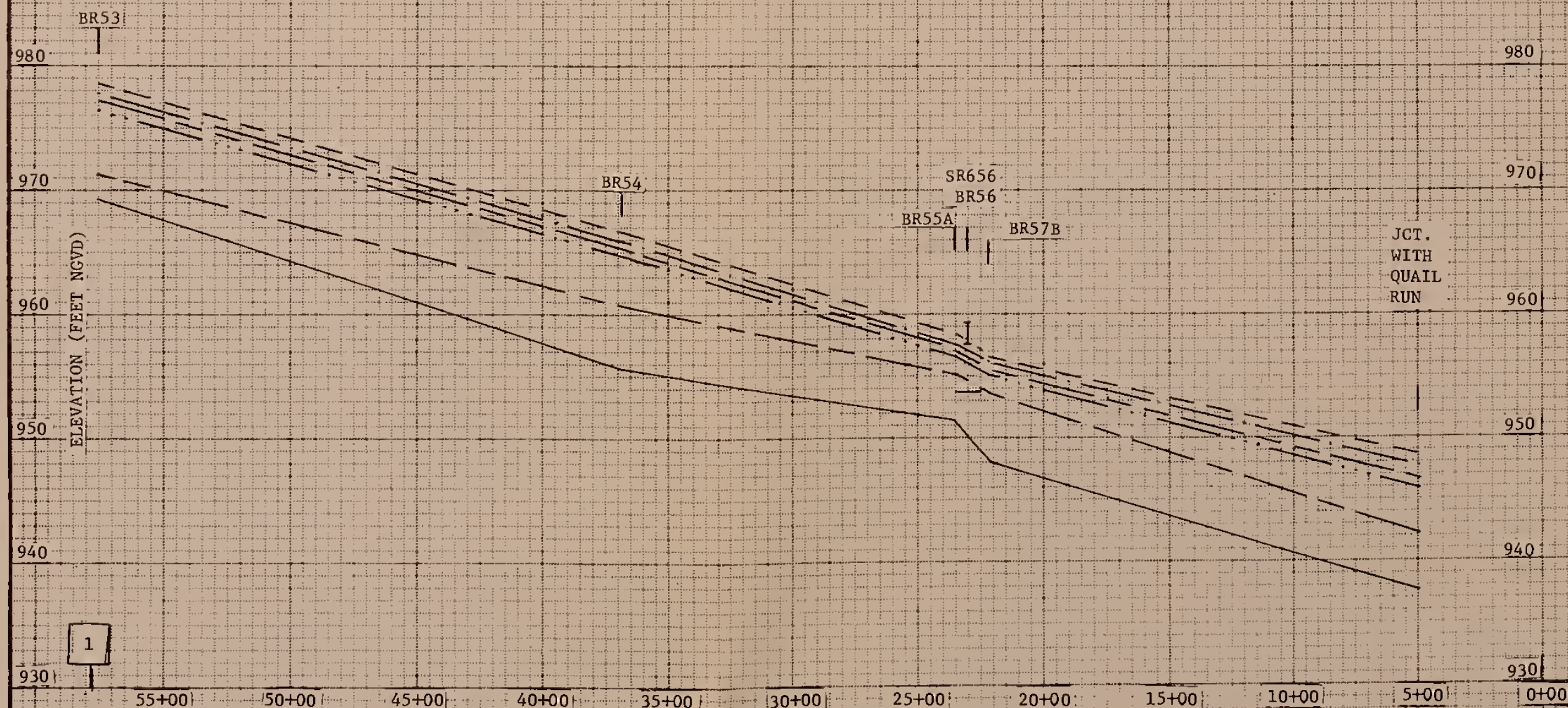
FLOOD PROFILES  
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

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SOIL CONSERVATION SERVICE

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DATE:   
PLATE 7 of 8  
QUAIL RUN -See  
Photomap QR3

LEGEND

500 YR	-----	SURVEYED X-SECTION	BR52
100 YR	-----	ELEV-BRIDGE DECK	
50 YR	-----	ELEV-LOW BEAM	
10 YR	-----	ELEV-LOW ROAD	
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	2



BOONE RUN  
CHANNEL STATIONS  
FEET ABOVE MOUTH



FLOOD PROFILES  
S FK SHENANDOAH RIVER TRIBS  
ROCKINGHAM COUNTY, VIRGINIA

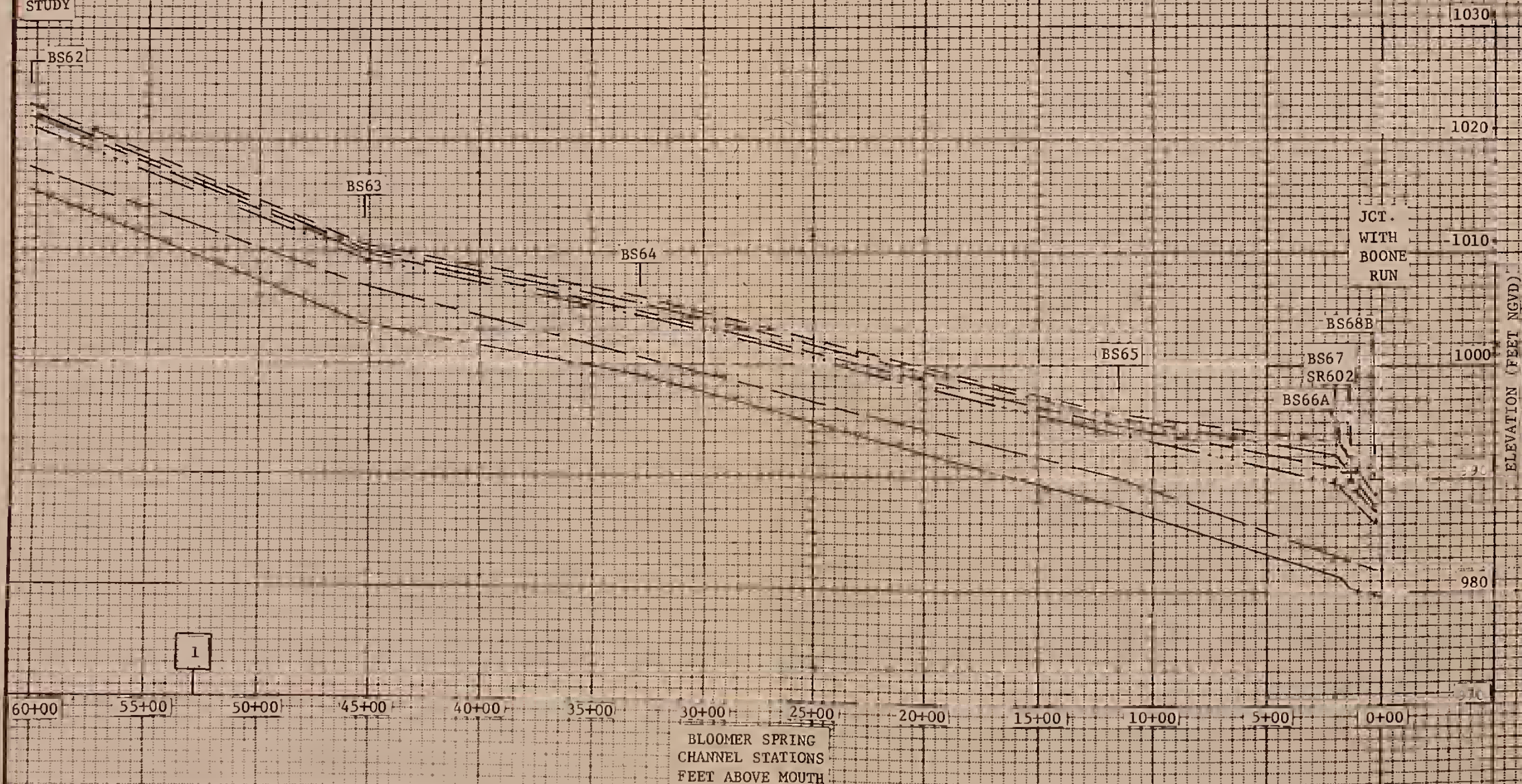
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SOIL CONSERVATION SERVICE

Date: MAM 10/79  
Plate 8 of 8  
QUAIL RUN-See  
Photomap BRI

LEGEND

500 YR	-----	SURVEYED X-SECTION	BR52
100 YR	-----	ELEV-BRIDGE DECK	I
50 YR	-----	ELEV-LOW BEAM	I
10 YR	....	ELEV-LOW ROAD	I
LOW BANK	-----	STATE ROUTE 600	SR 600
CHANNEL BOTTOM	-----	US HIGHWAY 99	US 99
		STREAM MILES	2

UPPER  
LIMIT  
OF  
STUDY





# TYPICAL CROSS SECTIONS

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Designed \_\_\_\_\_  
Drawn \_\_\_\_\_  
Traced \_\_\_\_\_  
Checked \_\_\_\_\_

Base

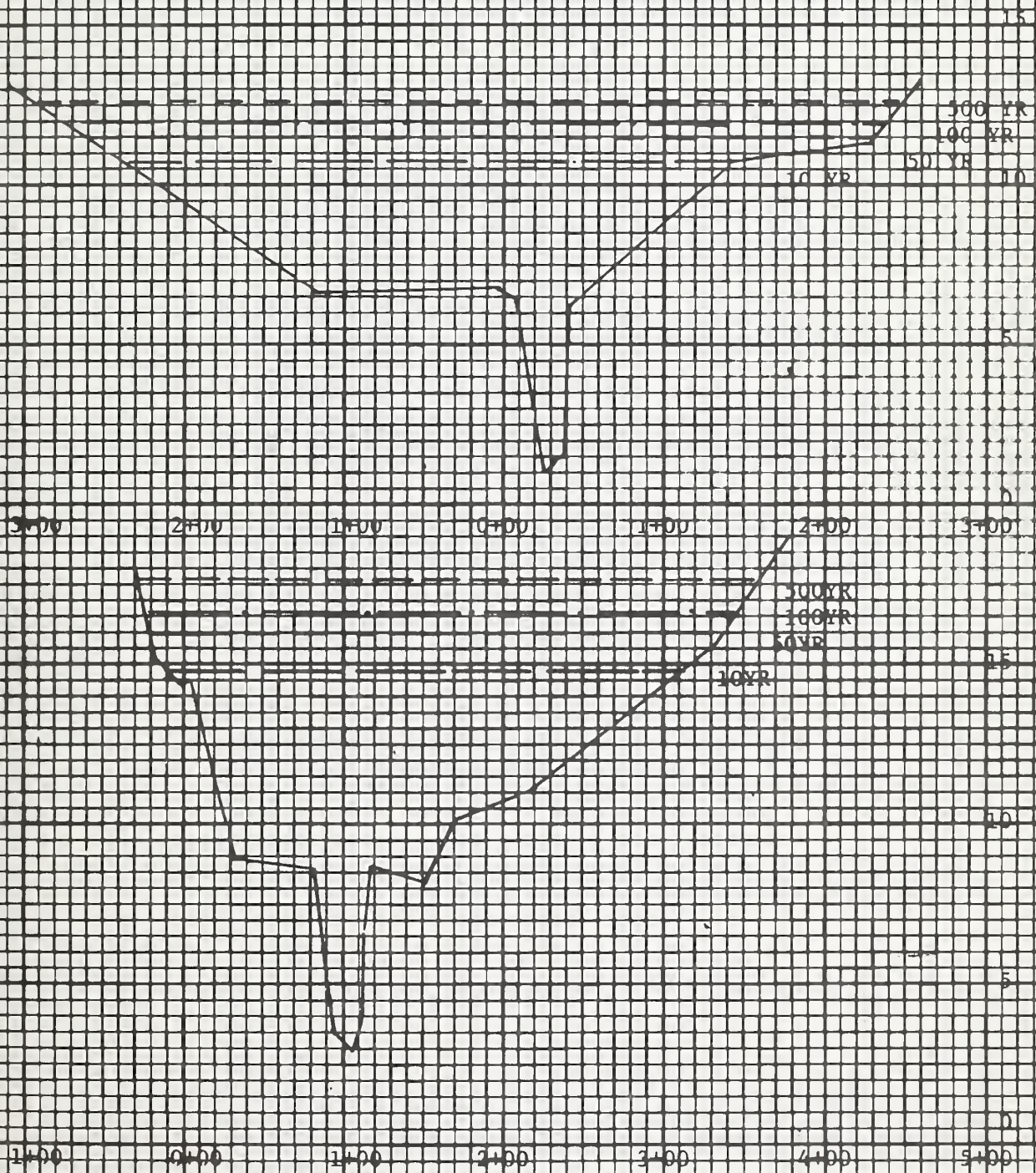




Table QR-1 Frequency-discharge-elevations, Quail Run  
South Fork Shenandoah River Tributaries, Rockingham County, Virginia

X-Sec.	Profile		10-year		25-year		50-year		100-year		500-year	
	Photomap	DA	Disch.	Elev.	Disch.	Elev.	Disch.	Elev.	Disch.	Elev.	Disch.	Elev.
No.	Plate	(sq mi)	(cfs)	(ngvd)	(cfs)	(ngvd)	(cfs)	(ngvd)	(cfs)	(ngvd)	(cfs)	(ngvd)
Quail Run - Upper limit of study												
QR3	QR1	1	1.5	590	1155.5	730	1155.7	860	1155.8	980	1156.0	1160
QR4	QR1	1	2.4	790	1136.1	1000	1136.4	1210	1136.6	1400	1136.9	1700
QR5	QR1	1	2.6	830	1100.1	1060	1100.4	1280	1100.7	1500	1101.0	1820
QR6	QR1	1	2.8	870	1082.4	1100	1082.7	1330	1083.0	1590	1083.2	1980
QR7	QR1	1	3.6	1010	1061.0	1300	1061.5	1600	1061.9	1900	1062.2	2400
QR8A	QR2	1	3.8	1040	1040.0	1370	1040.4	1670	1041.0	1990	1041.8	2500
QR9	QR2	1	State Route 602 - Bridge deck - 1041.8 - Low steel - 1040.3 - Low Road - 1041.7									
QR10B	QR2	1,2	3.8	1040	1037.6	1370	1038.2	1670	1038.4	1990	1038.7	2500
QR11	QR2	2	4.4	1140	1020.4	1490	1020.7	1830	1021.0	2210	1021.4	2840
QR12	QR2	2	4.6	1180	1007.0	1520	1007.6	1900	1008.1	2290	1008.6	2990
QR13	QR2	2	4.7	1190	997.0	1550	997.4	1920	997.6	2310	997.8	3000
QR14	QR2	2	4.8	1200	990.5	1590	991.0	1950	991.4	2390	991.7	3050
QR15A	QR2	2	5.1	1230	980.4	1620	981.0	2000	981.4	2410	981.7	3200
QR16	QR2	2	State Route 637 - Bridge deck - 981.4 - Low steel - 979.2 - Low Road - 979.8									
QR17B	QR2	2	5.1	1230	979.3	1620	979.6	2000	979.4	2410	980.2	3200
QR18	QR2	2,3	5.3	1290	970.1	1690	970.5	2100	970.7	2550	971.0	3300
QR19A	QR3	3	5.4	1300	958.7	1700	959.1	2120	959.4	2600	959.7	3400
QR20	QR3	3	State Route 636 - Bridge deck - 959.2 - Low steel - 958.3 - Low road - 957.3									
QR21B	QR3	3	5.4	1300	957.5	1700	958.0	2120	958.3	2600	958.6	3400
QR22	QR3	3	17.3	4000	946.0	5250	946.7	6350	947.2	7400	947.5	9850
QR23A	**	3	17.9	4050	935.3	5300	936.3	6400	937.0	*	*	*
QR24	**	3	State Route 635 - Bridge deck - 938.6 - Low steel - 934.4 - Low road - 937.4									
QR25B	**	3	17.9	4050	934.4	5300	934.8	*	*	*	*	*

Jct w/South Fork Shenandoah River

\*Stages on main stem S. Fk. Shenandoah River override those on Quail Run

\*\*See S. Fk. Shenandoah (main stem) photomap 20 of 25

Table QR-1 (Continued) Frequency-discharge-elevations, Boone Run  
South Fork Shenandoah River Tributaries, Rockingham County, Virginia, Continued

X-Sec.	Profile		10-year		25-year		50-year		100-year		500-year	
	Photomap No.	Plate No.	DA (sq mi)	Disch. (cfs)	Elev. (ngvd)	Disch. (cfs)	Elev. (ngvd)	Disch. (cfs)	Elev. (ngvd)	Disch. (cfs)	Elev. (ngvd)	
Boone Run, tributary of Quail Run - upper limit of study												
BR41	*	4	3.5	1630	1315.0	2030	1315.4	2390	1315.7	2810	1316.0	3500
BR42A	*	4	3.8	1720	1269.5	2160	1269.7	2300	1270.1	3000	1270.5	3790
BR43	BR1	4	State Route 637 - Bridge deck - 1268.5 - Low steel - 1267.6 - Low Road - 1265.8									
BR44B	BR1	4	3.8	1720	1265.0	2160	1265.4	2500	1265.6	3000	1265.8	3790
BR441	BR1	4	3.9	1760	1219.2	2190	1219.5	2530	1219.8	3040	1220.1	3800
BR45	BR1	4	4.6	1930	1183.3	2420	1183.8	2820	1184.1	3400	1184.5	4250
BR46	BR1	4,5	4.7	1960	1158.7	2490	1159.0	2880	1159.2	3480	1159.5	4350
BR47	BR1	5	4.8	2000	1098.7	2500	1099.3	2900	1099.5	3500	1100.0	4400
BR48	BR1	5,6	5.1	2060	1054.1	2600	1054.4	3000	1054.5	3630	1054.7	4600
BR49	BR1	6	5.9	2100	1009.9	2690	1010.1	3120	1010.2	3720	1010.5	4800
BR50A	BR1	6	6.5	2150	989.8	2750	990.9	3400	991.5	3810	991.7	5000
BR51	BR1	6	State Route 602 - Bridge deck 989.9 - Low steel - 988.3 - Low road - 989.9									
BR52B	BR1	6	10.8	3700	987.5	4650	988.0	5400	988.3	6400	988.6	8240
BR53	QR3	6,7	11.2	3400	976.7	4500	977.3	5200	977.5	6100	977.9	7800
BR54	QR3	7	11.6	3250	964.7	4400	965.3	5050	965.6	5900	966.0	7600
BR55A	QR3	7	11.7	3200	956.8	4300	957.2	4850	957.4	5810	957.6	7420
BR56	QR3	7	State Route 636 - Bridge deck - 959.1 - Low steel - 957.7 - Low road - 953.7									
BR57B	QR3	7	11.7	3200	955.2	4300	955.6	4850	955.7	5810	956.1	7420
Jct w/Quail Run												
**Narrow wooded reach not shown on photomap.												
Bloomer Spring, tributary of Boone Run - upper limit of study												
BS62	BR1	8	2.2	770	1021.3	980	1021.7	1140	1022.0	1360	1022.5	1700
BS63	BR1	8	2.4	840	1009.4	1060	1009.7	1250	1009.9	1490	1010.2	1830
BS64	BR1	8	4.1	1390	1004.2	1520	1004.4	1750	1004.7	2490	1005.4	3150
BS65	BR1	8	4.3	1450	994.0	1850	994.4	2150	994.7	2600	995.2	3300
BS66A	BR1	8	4.3	1450	989.9	1850	990.6	2150	991.0	2600	992.0	3300
BS67	BR1	8	State Route 602 - Bridge deck - 991.9 - Low steel - 989.9 - Low road - 990.6									
BS68B	BR1	8	4.3	1450	986.5	1850	987.0	2150	987.3	2600	987.6	3300
Jct w/Boone Run												

Table QR-2 Benchmark descriptions, Quail Run - Boone Run, Rockingham County, Virginia

<u>B.M. No.</u>	<u>Photo Sheet No.</u>	<u>Description, location and elevation</u>
29	QR-2	SCS TBM - A square chiseled on the upstream (northwest) abutment of bridge no. 6537 over Quail Run on State Route 602. Elevation 1041.82
22	QR-3	SCS TBM - A square is chisled on the upstream (southwest) abutment of bridge over Quail Run on State Route 636, 600 feet west from the junction with State Route 635. Elevation 958.40
21	QR-3	SCS TBM - a square is chisled on the upstream (southwest) abutment of bridge over Boone Run on State Route 636. Elevation 958.91
10	BR-1	SCS TBM - A square is chisled on the upstream (southwest) abutment of bridge over Boone Run on State Route 602. Elevation 989.85
26	QR-1	SCS TBM - A square chiseled on the upstream (northwest) headwall of bridge over Quail Run on State Route 646. Elevation 1099.69

Note: Elevation in feet above National Geodetic Vertical Datum of 1929.







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